Introduction

The development and maintenance of chronic pain crucially depends on neuroplasticity in the central nervous system, and also reportedly depends on the role of innate immune system in the blood (Fig. 1). These have led to some research to find a novel blood marker for chronic pain, and brain-derived neurotrophic factor (BDNF) is one of its candidates.

The aim of this study was to examine the correlation between serum BDNF concentration and the pain states in chronic pain patients.

Methods

A total of 8 patients from chronic low back pain were enrolled, and completed the Self-Rating Questionnaire for Depression (SRQ-D), State-Trait Anxiety Inventory 1 (STAI-1), Barthel Index, and Mini-Mental State Examination (MMSE). Pain status was evaluated using the short-form McGill Pain Questionnaire (SF-MPQ) and the Douleur Neuropathique 4 (DN4) Questionnaire for evaluating neuropathic pain symptoms. Serum BDNF concentrations were measured using the EUSA. Genome-wide assays of DNA methylation and mRNA expression were also performed in the whole blood.

Statistics

To investigate the association between the patient status and serum BDNF concentration, we performed multiple linear regression analysis using a stepwise variable selection.

Results

There was a significant correlation between increases of serum BDNF concentrations and decreases in the number of neuropathic pain symptoms (Fig. 2).

The increase in serum BDNF concentrations also showed significant relation to the increase of BDNF mRNA expression (Fig. 2).

Increases in the methylation levels of the exon III region in the BDNF gene (Fig. 3) were significantly related to decreases in serum BDNF concentrations (Fig. 4).

Conclusion

Our study showed that epigenic changes in BDNF genes in the peripheral blood cells cause the decrease in the serum concentrations of BDNF in patients suffering from chronic back pain and that the decrease of serum BDNF correlates with the increase in the number of neuropathic pain symptoms.